Chapter Menu

Steven P. Lynch

What are living things, and how can they be classified?

Get Ready

What do you think?

Before you begin, decide if you agree or disagree with each of these statements. As you view this presentation, see if you change your mind about any of the statements.

Get Ready

Do you agree or disagree?

1. All living things move.
2. The Sun provides energy for almost all organisms on Earth.
3. A dichotomous key can be used to identify an unknown organism.

Get Ready

Do you agree or disagree?

4. Physical similarities are the only traits used to classify organisms.

5. Most cells are too small to be seen with the unaided eye.

6. Microscopes are used only by scientists.

Lesson 1

Characteristics of Life

Key Concepts

- What characteristics do all living things share?

Lesson 1

Characteristics of Life

Vocabulary

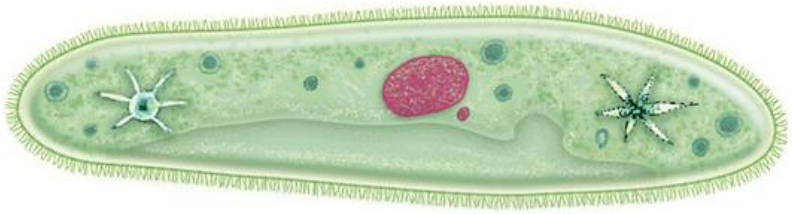
- organism
- cell
- unicellular
- multicellular
- homeostasis

Characteristics of Life

- All living things are organized, grow and develop, reproduce, respond, maintain certain internal conditions, and use energy.
- Things that have all the characteristics of life are called **organisms**.

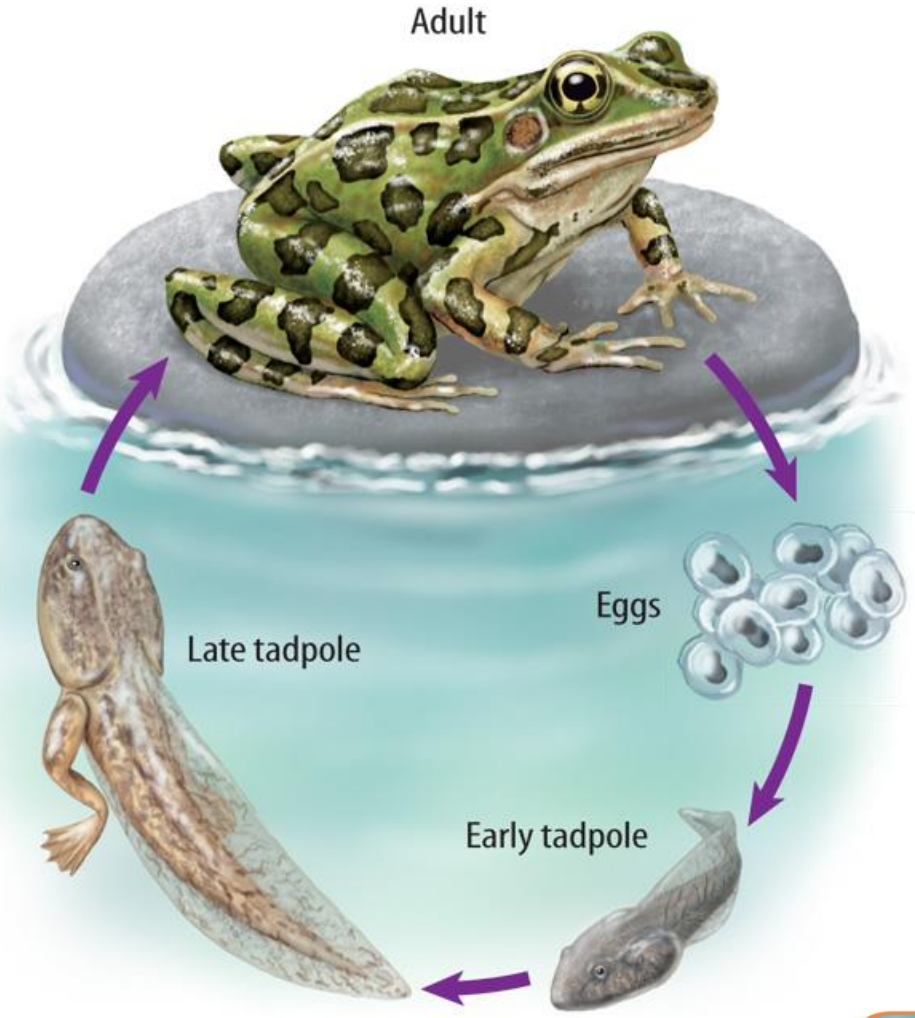
Organization

- A **cell** is every organism's smallest unit of life.
- **Unicellular** organisms are organisms made of only one cell.
- Living things that are made of two or more cells are called **multicellular** organisms.



Growth and Development

- Changes that occur in an organism during its lifetime are called development.
- In multicellular organisms, development happens as cells become specialized into different cell types.
- Some organisms have dramatic developmental changes, such as a tadpole becoming a frog.



Get Animated

Reproduction

- Reproduction is the process by which one organism makes one or more new organisms.
- Some organisms can reproduce by dividing and becoming two new organisms.
- Some organisms must have a mate to reproduce, but others can reproduce without a mate.

Responses to Stimuli

- All living things respond to changes in the environment called stimuli. There are two types of stimuli:
  - Internal stimuli are changes within an organism.
  - External stimuli are changes in an organism's environment.

Homeostasis

An organism's ability to maintain steady internal conditions when outside conditions change is called **homeostasis**.

WORD ORIGIN

homeostasis

from Greek *homoios*, means "like, similar"; and *stasis*, means "standing still"

Homeostasis (cont.)

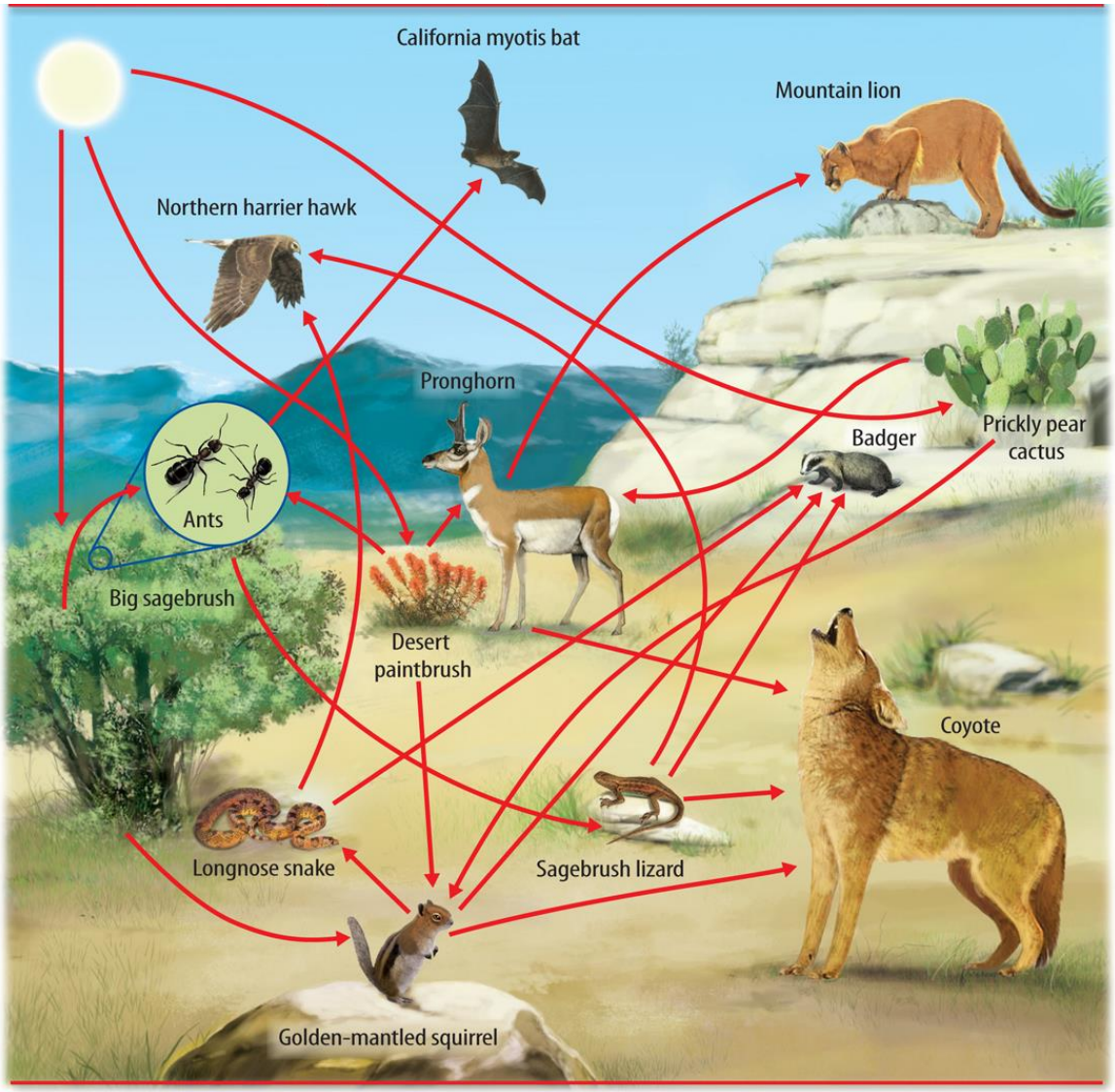
Maintaining homeostasis ensures that cells and the organism can function normally and remain healthy.

Homeostasis (cont.)

Contractile vacuoles are cellular structures that help maintain homeostasis by pumping excess water from the cell.

Energy

- Cells continuously use energy to transport substances, make new cells, and perform chemical reactions.
- For most organisms, energy for life comes from the Sun. The Sun's energy can be passed from one organism to another.


California myotis bat
Mountain lion
Northern harrier hawk
Pronghorn
Prickly pear cactus
Badger
Ants
Big sagebrush
Desert paintbrush
Coyote
Longnose snake
Sagebrush lizard
Golden-mantled squirrel

Characteristics of Life	
Characteristic	**Definition**
Organization	Living things have specialized structures with specialized functions. Living things with more than one cell have a greater level of organization because groups of cells function together.
Growth and development	Living things grow by increasing cell size and/or increasing cell number. Multicellular organisms develop as cells develop specialized functions.
Reproduction	Living things make more living things through the process of reproduction.

Characteristics of Life	
Characteristic	**Definition**
Response to stimuli	Living things adjust and respond to changes in their internal and external environments.
Homeostasis	Living things maintain a stable internal environment.
Use of energy	Living things use energy for all the processes they perform. Living things get energy by making their own food, eating food, or absorbing food.

Energy (cont.)

KEY CONCEPT CHECK

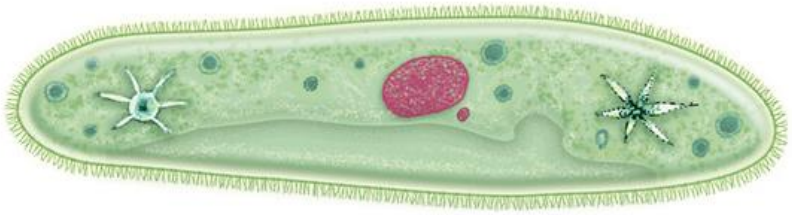
What characteristics do all living things share?

Summary

- An organism has all the characteristics of life.

Summary

- Unicellular organisms have specialized structures, much like a house has rooms for different activities.
- Homeostasis enables living things to maintain a steady internal environment.



Lesson Review

What term refers to things that have all the characteristics of life?

A. cells

B. unicellular organisms

C. organisms

D. multicellular organisms

Lesson Review

Which of these refers to changes in an organism's environment?

A. external stimuli
B. homeostasis
C. internal stimuli
D. development

Lesson Review

Homeostasis refers to an organism's ability to maintain what kind of conditions?

A. external

B. internal

C. cellular

D. environmental

Lesson Review

What do you think NOW?

Do you agree or disagree?

1. All living things move.
2. The Sun provides energy for almost all organisms on Earth.

Lesson 2

Classifying Organisms

Key Concepts

- What methods are used to classify living things into groups?
- Why does every species have a scientific name?

Lesson 2

Classifying Organisms

Vocabulary

- binomial nomenclature
- species
- genus
- dichotomous key
- cladogram

Classifying Living Things

- There have been many different ideas about how to organize, or classify, living things.
- Carolus Linnaeus classified organisms into two main groups, called kingdoms, based on similar structures.

Determining Kingdoms (cont.)

Science Use v. Common Use

kingdom

Science Use a classification category that ranks above phylum and below domain

Common Use a territory ruled by a king or a queen

Determining Domains

- The current classification method for organisms is called systematics.
- Systematics uses all known evidence to classify organisms, including cell type, how food and energy are obtained, structure and function of features, common ancestry, and molecular analysis.

Determining Domains (cont.)

Organisms are now classified into one of three domains and then into one of six kingdoms.

Domains and Kingdoms

Domain	Bacteria	Archaea	Eukarya			
Kingdom	Bacteria	Archaea	Protista	Fungi	Plantae	Animalia
Example						
Characteristics						

Determining Domains (cont.)

KEY CONCEPT CHECK

What evidence is used to classify living things into groups?

Scientific Names

- **Binomial nomenclature** is a system for naming organisms with two-word scientific name:
  - A **species** is a group of organisms that have similar traits and are able to produce fertile offspring.
  - A **genus** is a group of similar species.

Scientific Names (cont.)

WORD ORIGIN

genus

from Greek *genos*, means “race, kind”

Classification of the Brown Bear

Taxonomic Group	Number of Species	Examples

Scientific Names (cont.)

- Binomial nomenclature was developed by Linnaeus and is still used today.
- Scientific names are important because each species has its own scientific name and those names are the same worldwide.

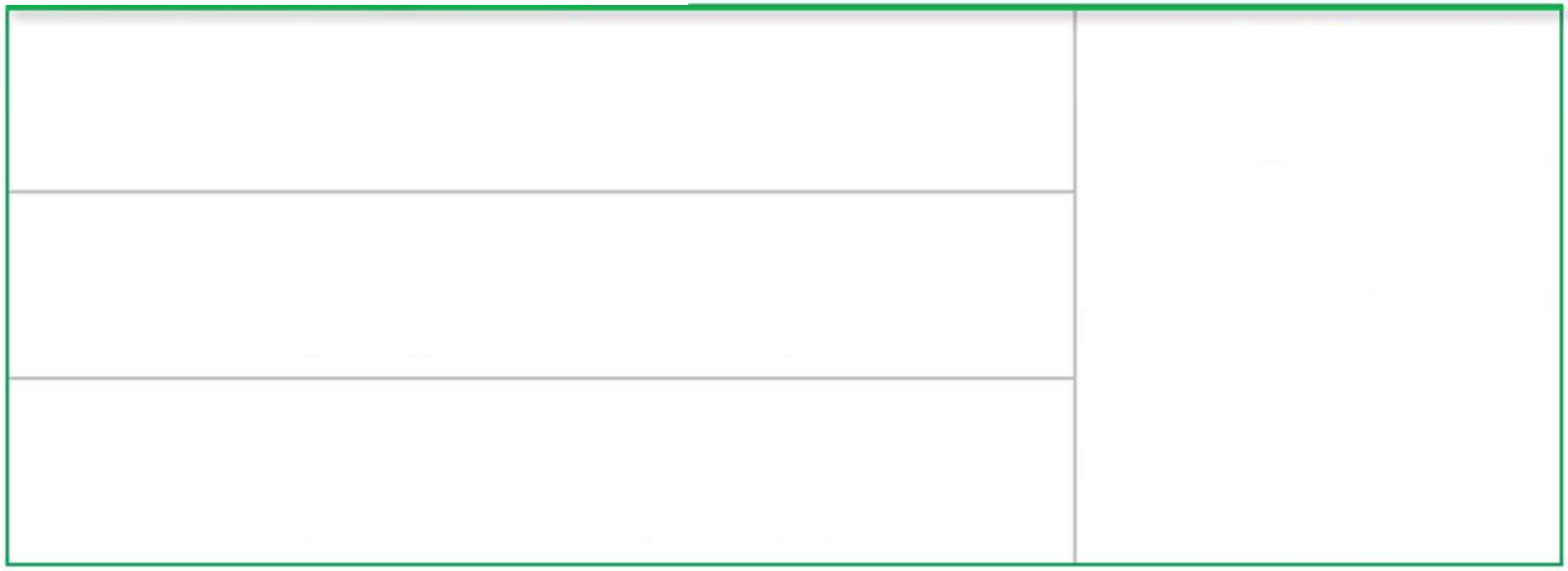
Scientific Names (cont.)

Key Concept Check

Why does every species have a scientific name?

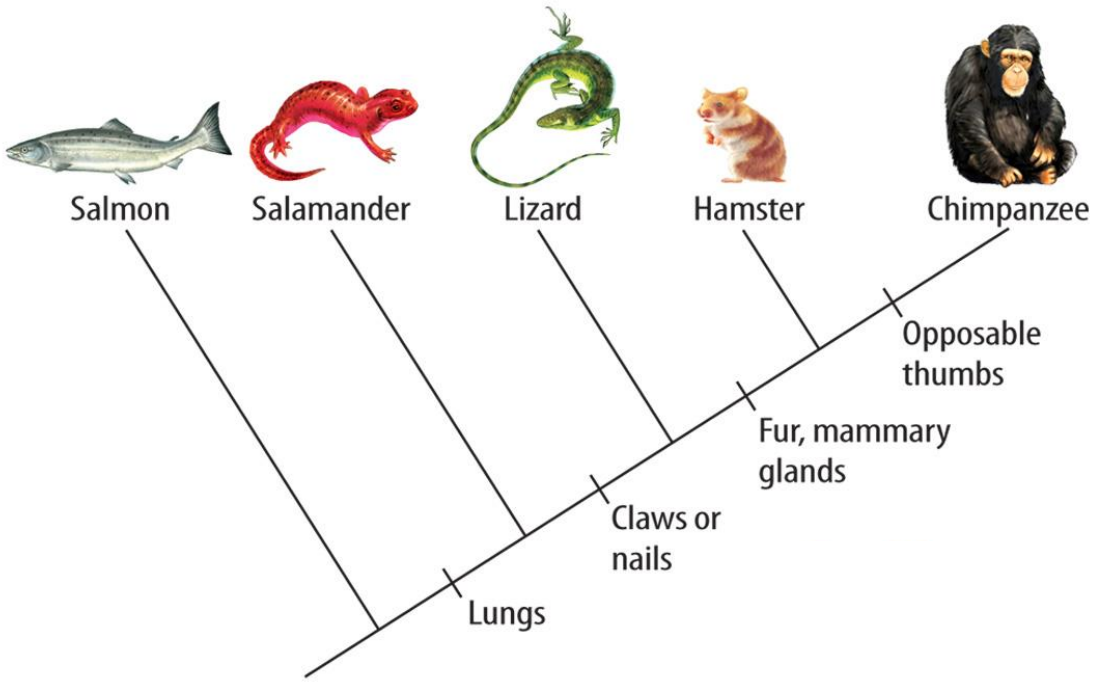
Classification Tools (cont.)

A **dichotomous key** is a series of descriptions arranged in pairs that lead the user to the identification of an unknown organism.



Classification Tools (cont.)

A **cladogram** is a branched diagram that shows the relationships among organisms, including common ancestors.



Get Animated

Summary

- All organisms are classified into one of three domains: Bacteria, Archaea, or Eukarya.

Summary

- Every organism has a unique species name.

Summary

- A dichotomous key helps to identify an unknown organism through a series of paired descriptions.

Lesson Review

How many scientific names does each organism have?

A. 1

B. 2

C. 3

D. Many

Lesson Review

Which of these refers to the system for naming organisms with two identifying scientific terms?

A. genus

B. cladogram

C. binomial domains

D. binomial nomenclature

Lesson Review

Which of these refers to a series of descriptions arranged in pairs that help identify an unknown organism?

A. dichotomous key

B. domain

C. cladogram

D. genus

Lesson Review

What do you think NOW?

Do you agree or disagree?

3. A dichotomous key can be used to identify an unknown organism.

4. Physical similarities are the only traits used to classify organisms.

Lesson 3

Exploring Life

Key Concepts

- How did microscopes change our ideas about living things?
- What are the types of microscopes, and how do they compare?

Lesson 3

Exploring Life

Vocabulary

- light microscope
- compound microscope
- electron microscope

The Development of Microscopes

- The invention of microscopes enabled people to see details of living things that could not be seen with the unaided eye.
- One of the first microscopes, invented by Anton van Leeuwenhoek in the late 1600s, could magnify an image about 270 times its original size.

The Development of Microscopes (cont.)

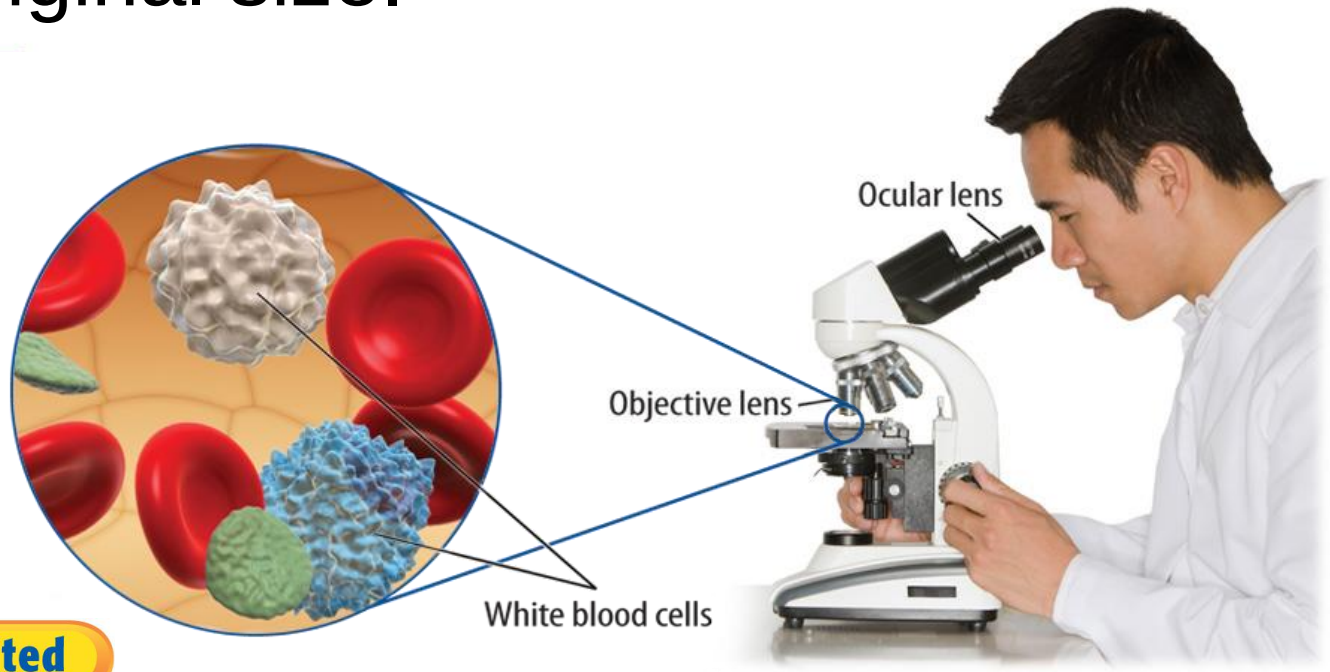
In the early 1700s Robert Hooke used a microscope to observe and name cells for the first time.

Key Concept Check

How did microscopes change our ideas about living things?

Types of Microscopes

A **compound microscope** is a **light microscope** that uses more than one lens to enlarge images up to 1,500 times their original size.



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Get Animated

Types of Microscopes (cont.)

- An **electron microscope** can magnify an image up to 100,000 times or more.
- Because objects must be mounted in plastic and sliced, a transmission electron microscope (TEM) can only be used to view nonliving objects.

Types of Microscopes (cont.)

A scanning electron microscope (SEM) is used to view a three-dimensional image of an object.

Key Concept Check

What are the types of microscopes, and how do they compare?

Using Microscopes

Microscopes can assist doctors by enabling them to view a surgical area in greater detail.

WORD ORIGIN

microscope

from Latin *microscopium*, means "an instrument for viewing what is small"

Using Microscopes (cont.)

- There are many uses for microscopes in fields in addition to health care:
  - Forensic scientists use microscopes to study evidence from crime scenes.
  - People who study fossils use microscopes to examine fossils and other materials from where fossils are found.

Summary

- Living organisms can be viewed with light microscopes.

U.S. National Tick Collection/Getty Images

Summary

- A compound microscope is a type of light microscope that has more than one lens.
- Living organisms cannot be viewed with a transmission electron microscope.

JGI/Getty Images

Lesson Review

Anton van Leeuwenhoek's early version of the microscope could magnify an image to about how many times its original size?

A. 2

B. 100

C. 100,000

D. 270

Lesson Review

What type of microscopes use more than one lens to magnify an image up to 1,500 times its original size?

A. transmission electron microscope

B. scanning electron microscope

C. compound microscope

D. electron microscope

Lesson Review

What do electron microscopes use to focus a beam of electrons through an object or onto an object's surface?

A. a magnetic field

B. light

C. lenses

D. energy

Lesson Review

What do you think NOW?

Do you agree or disagree?

5. Most cells are too small to see with the unaided eye.

6. Only scientists use microscopes.

Menu

All living things share certain characteristics and can be organized in a functional and structural hierarchy. The invention of the microscope has enabled us to explore life further, which has led to changes in classification.

Lesson 1: Characteristics of Life

- An organism is classified as a living thing because it has all the characteristics of life.
- All living things are organized, grow and develop, reproduce, respond to stimuli, maintain homeostasis, and use energy.

Lesson 2: Classifying Organisms

- Living things are classified into different groups based on physical or molecular similarities.
- Some species are known by many different common names. To avoid confusion, every species has a scientific name based on a system called binomial nomenclature.

Lesson 3: Exploring Life

- The invention of microscopes allowed scientists to view cells, which enabled them to further explore and classify life.
- A light microscope uses light and has one or more lenses to enlarge an image up to about 1,500 times its original size. An electron microscope uses a magnetic field to direct beams of electrons, and it enlarges an image 100,000 times or more.

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Chapter Review

Which term refers to living organisms that are made of only one cell?

A. organisms

B. unicellular organisms

C. multicellular organisms

D. organelles

Chapter Review

Which is an example of an external stimulus?

A. sunlight

B. body temperature

C. reflexes

D. thirst

Chapter Review

The five kingdoms established by Robert Whittaker for classifying organisms are Monera, Protista, Plantae, Fungi, and which of the following?

A. Genus

B. Bacteria

C. Animalia

D. Species

Chapter Review

Sweating when you are hot is an example of your body working to maintain which of these?

A. external conditions

B. energy

C. homeostasis

D. internal stimuli

Chapter Review

Light microscopes can enlarge images up to how many times their original size?

A. 2

B. 1 million

C. 150

D. 1,500

Standardized Test Practice

What is the smallest unit of life in any organism?

A. an organism

B. a multicellular organism

C. an atom

D. a cell

Standardized Test Practice

During which process does one organism make one or more new organisms?

A. homeostasis

B. development

C. reproduction

D. production

Standardized Test Practice

Which of these refers to a group of organisms that have similar traits and are able to produce fertile offspring?

A. genus

C. family

B. species

D. class

Standardized Test Practice

Similar species of organisms are grouped into which one of these?

A. genus
B. family
C. scientific name
D. kingdom

Standardized Test Practice

Which type of microscope uses a magnetic field to focus a beam of electrons through an object or onto an object's surface?

A. electron microscopes

B. atomic microscopes

C. light microscopes

D. compound microscopes